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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Young-Ki Kim et al.		
Title:	APPARATUS AND METHOD OF DRIVING LIQUID CRYSTAL DISPLAY HAVING DIGITAL GRAY DATA		
Application No.:	10/758,543	Filing Date:	January 16, 2004
Examiner:	William Boddie	Group Art Unit:	2629
Docket No.:	AB-1706 US	Confirmation No.	5598

Irvine, California
January 31, 2008

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1) Amended Second Appeal Brief Transmittal (1 page); and
2) Appellant's Second Amended Opening Brief (13 pages)

Dated: Jan 31, 2008

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TRANSMITTAL OF SECOND AMENDED APPEAL BRIEF	Docket No. AB-1706 US

In re Application of: Young-Ki Kim et al.

Application No.	Filing Date	Examiner	Group Art Unit
10/758,543	January 16, 2004	William Boddie	2629

Invention:
APPARATUS AND METHOD FOR DRIVING LIQUID CRYSTAL DISPLAY HAVING DIGITAL GRAY DATA

TO THE COMMISSIONER OF PATENTS:

Transmitted herewith is the Second Amended Opening Brief in response to the Notice of Non-Compliant Appeal Brief dated January 2, 2008

The fee for filing this Appeal Brief is **ALREADY PAID**.

[X] **Large Entity** [ ] **Small Entity**

[ ] Applicant(s) Petitions for an Extension of Time for :

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Dated: 1/31/08

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UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

Application Ser. No.: 10/758,543	Attorney Docket No.: AB-1706 US
Filing Date: 01/16/2004	Examiner: William Boddie
Inventors: Young-Ki Kim, et al.	Art Unit: 2629
Title: Apparatus and Method for Driving Liquid Crystal Display Having Digital Gray Data	Ref. No. OPP20021428US

APPELLANT'S SECOND AMENDED OPENING BRIEF

Real Party In Interest

The real party in interest herein is the assignee of this application, Samsung Electronics Co., Ltd., a corporation.

Related Appeals and Interferences

There are no other appeals or interferences which will directly affect or be directly affected by or otherwise have a direct bearing on the Board's decision in the pending appeal.

Status of Claims

Claim 2 is cancelled.

Claims 1 and 3 – 13 are pending.

Claim 1, 3-6, 9, 10 and 13 are rejected.

Claims 7-8 and 11-12 are objected to.

The rejection of claims 1, 3-6, 9, 10 and 13 is appealed.

A listing of the claims and their current status is found in Appendix I hereto.

Status of Amendments

An Amendment after Final under 37 C.F.R. §1.116 amending claim 3 to comply with a requirement of form was filed on July 9, 2007.

An Advisory Action entering the amendment to claim 3 but holding the same insufficient to place the application in a condition for allowance was issued on July 23, 2007.

A Pre-Appeal Brief Request for Review of the final rejection of claims 1, 3-6, 9, 10 and 13, without amendments, was filed on August 9, 2007.

A Notice of Panel Decision from the Pre-Appeal Review sustaining the Examiner's rejection of claims 1, 3-6, 9, 10 and 13 was issued on September 9, 2007.

Accordingly, there are no amendments currently pending in this Application, and none is submitted with this appeal.

Summary of Claimed Subject Matter

This application includes two independent claims 1 and 9, which are mapped below with reference to the published specification by page, paragraph number and drawings thereof.

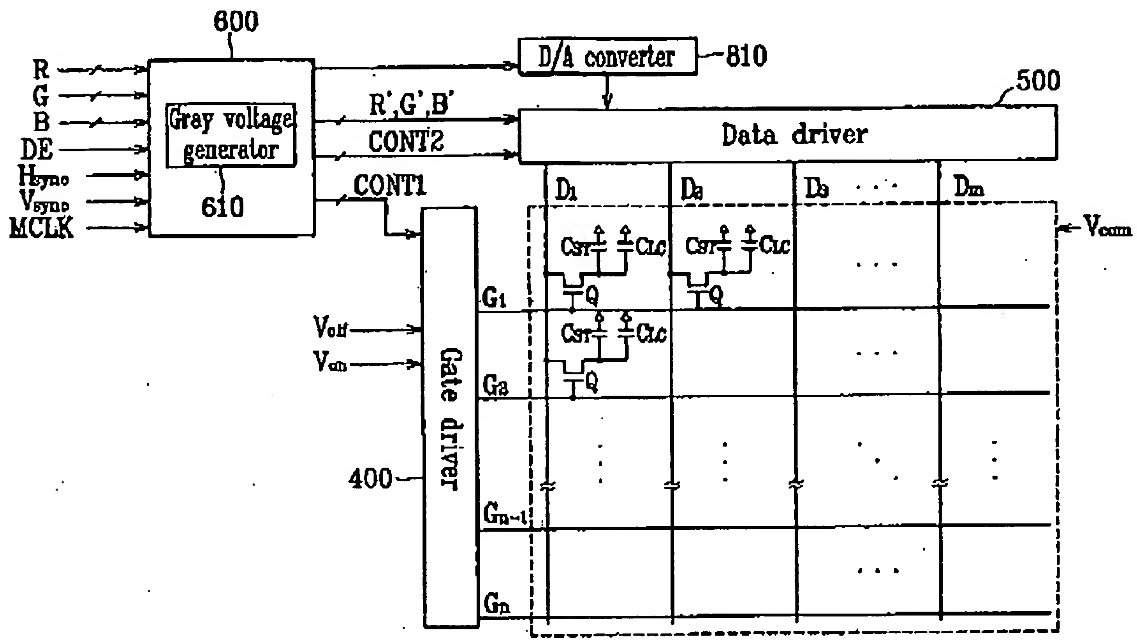
Independent Claim	Support for limitation in specification[1]
1. An apparatus for driving a liquid crystal display, including a plurality of pixels arranged in a matrix, the apparatus comprising:	Fig. 1, 300, 400, 500, 600, 810; p. 2, ¶[0032];p. 3, ¶¶[0043] – [0047].
a signal controller supplying image data to a data driver and generating digital gray data based on a distribution of grays of the image data for one frame; and,	Fig. 1, 600, 500; p. 2, ¶[0032]; p. 3, ¶¶[0047], [0050]; Figs. 1, 3 and 4; p. 3, ¶¶[0054] – [0061], p. 4, ¶¶[0062] – [0078]; p. 5, ¶¶ [0079] – 080].
a digital/analog converter converting the digital gray data from the signal controller into analog voltages and supplying the analog voltages to the data driver as the gray voltages,	Fig. 1, 810; p. 3, ¶¶ [0043], [0044], [0047], [0048], [0050], [0050]; p. 5, ¶[0080].
the data driver selecting data voltages corresponding to the image data representing at least one gray from the gray voltages and applying the data voltages to the pixels.	Fig. 1, 500; p. 2, ¶¶[0032], [0041]; p. 3, ¶¶[0043] – [0047], [0050], [0052].
9. A method for driving a liquid crystal display, the method comprising:	Figs. 1, 3 and 4; p. 3, ¶¶[0054].
reading out image data representing at least a gray for one frame;	Figs. 1, 3 and 4; p. 4, ¶¶[0062].
calculating gray distribution of the read image data;	Figs. 1, 3 and 4; p. 4, ¶¶[0064] – [0068].
modifying a standard gray voltage curve based on the calculated gray distribution to generate digital gray data;	Fig. 4, p. 4, ¶¶[0069] – [0076].
converting the digital gray data into analog voltages; and	Fig. 1, 810; p. 4, ¶ [0077]; p. 5, ¶[0080].
supplying the analog voltages to a data driver as gray voltages.	Fig. 1, 810; p. 4, ¶ [0077]; p. 5, ¶[0080].

[1] References are to published specification.

This application was filed Jan. 16, 2004, and claims priority benefits of Korean patent application 2003 – 0003226, filed Jan. 17, 2003.

This invention is directed to a signal controller 600 for a liquid crystal display (LCD) (Fig. 1 below; par. [0008] of published specification).

FIG. 1



The signal controller 600 includes a gray voltage generator 610 that, on a frame-by-frame basis, first calculates the distribution probabilities of the luminance of the image data in gray-scale level "sections" for each frame of data (Fig. 3, below, left, pars. [0066] – [0068]), then uses the gray distribution probabilities in a computational algorithm (Fig. 4 below, right, pars. [0069]-[0079]) to modify a standard digital gray voltage curve into a "target" digital gray voltage curve in which the gradient of the curve is increased in those sections in which the gray distribution is relatively large, and decreased in those sections in which the gray distribution is relatively small.

The gray voltage generator then serially outputs the modified target gray voltages to a conventional digital-to-analog (D/A) converter 810, which converts the digital target data to appropriate analog voltages, and then applies those analog voltages to the data driver 500 of the LCD for subsequent application to the LCD panel 300. (Fig. 1 above; par. [0080].)

FIG. 3

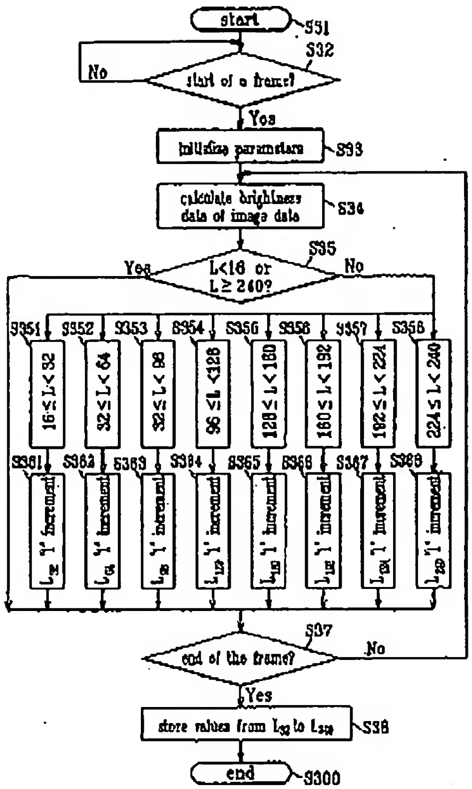
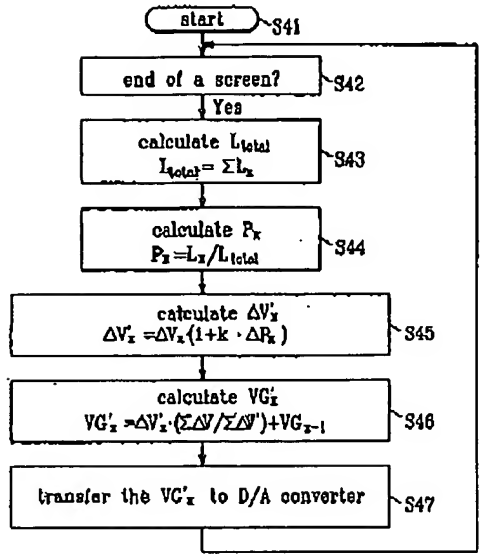


FIG. 4



Grounds Of Rejection To Be Reviewed On Appeal

Claims 1-3, 5-6 and 9-10 stand rejected under 35 U.S.C. 102(b) as being anticipated by Nitta et al. (US 6,801,178).

Claims 4 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Nitta et al. (US 6,801,178) in view of Kitahara et al. (US 6,847,377).

Argument

Twelve claims (1 and 3-13) are pending in this application, all directed to the above-described methods and apparatus for controlling an LCD. Of these, two claims (1 and 9)[2], reproduced below, are in independent form:

1. An apparatus for driving a liquid crystal display, including a plurality of pixels arranged in a matrix, the apparatus comprising:

a signal controller supplying image data to a data driver and generating digital gray data based on a distribution of grays of the image data for one frame; and,

a digital/analog converter converting the digital gray data from the signal controller into analog voltages and supplying the analog voltages to the data driver as the gray voltages,

the data driver selecting data voltages corresponding to the image data representing at least one gray from the gray voltages and applying the data voltages to the pixels. (Emphasis added.)

9. A method for driving a liquid crystal display, the method comprising:

reading out image data representing at least a gray for one frame;

calculating gray distribution of the read image data;

modifying a standard gray voltage curve based on the calculated gray distribution to generate digital gray data;

converting the digital gray data into analog voltages; and

supplying the analog voltages to a data driver as gray voltages. (Emphasis added.)

In section 5 of the final Office action of 05/09/2007 appealed herein, the Examiner rejected claims 1-3, 5-6 and 9-10 under 35 U.S.C. 102(b) as being anticipated by Nitta et al. (US 6,801,178), stating, in pertinent part,

> "With respect to claim 1, Nitta discloses … a digital/analog converter (11-15 in fig. 1; col. 4, lines 36-38) converting the digital gray data (5 in fig. 1) from the signal controller (1 in fig. 1) into analog voltages (VGO – VG255 in fig. 6) and supplying the analog voltages (16 in fig. 1) to the data driver as the gray voltages …." (Emphasis added.)

[2] See Claims Chart *supra*.

...

"With respect to claim 9, Nitta discloses ... converting the digital gray data into analog voltages (figs. 5-6, for example, col. 8, lines 4-9), and supplying the analog voltages (16 in fig. 1) to a data driver (26-28, 29-1 - 29-8 in fig. 1) as gray voltages." (Emphasis added.)

In light of the arguments that follow, it is respectfully submitted that the Examiner has erred, in that Nitta et al. ("Nitta") do not teach or suggest a D/A converter or an equivalent thereof.

The Nitta reference discloses a controller 1 for an LCD that controls a plurality of "data drivers 7-1 – 7-8," each of which includes a "gray scale voltage generating circuit 15" (Nitta, Fig. 1 below). According to Nitta, "selectors 207 and 208" of the gray scale voltage generating circuit 15 include a plurality of switches, the states of which are respectively defined by signals from a "register 13." Thus, each of the selectors 207 and 208 selects from among a plurality of analog voltages VG8, VG16, VG24, ... VG255 in accordance with a signal from the register 13.

That is, as described in Nitta and shown in FIG. 7 thereof, when the switch of the selector 207 that is connected to a line B1 is turned on, a voltage Vo is outputted as the voltage VG8, and as shown and described in FIG. 8 of Nitta, when the switch of the selector 208 that is connected to a line W6 is turned on, a voltage V8 is outputted as the voltage VG200. As a result, the selectors 207 and 208 operate to select from among analog reference voltages V0 and V8. *Id.*, col. 7, lines 16-33.

FIG. 1 - Nitta et al.

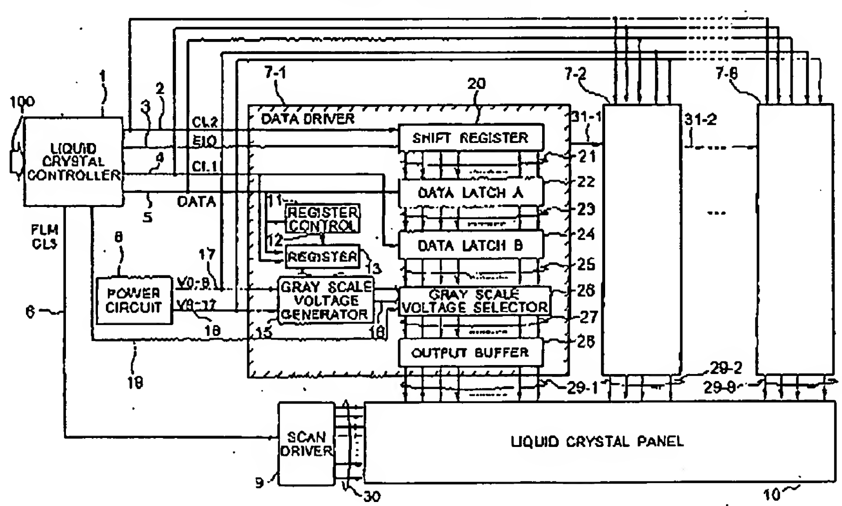
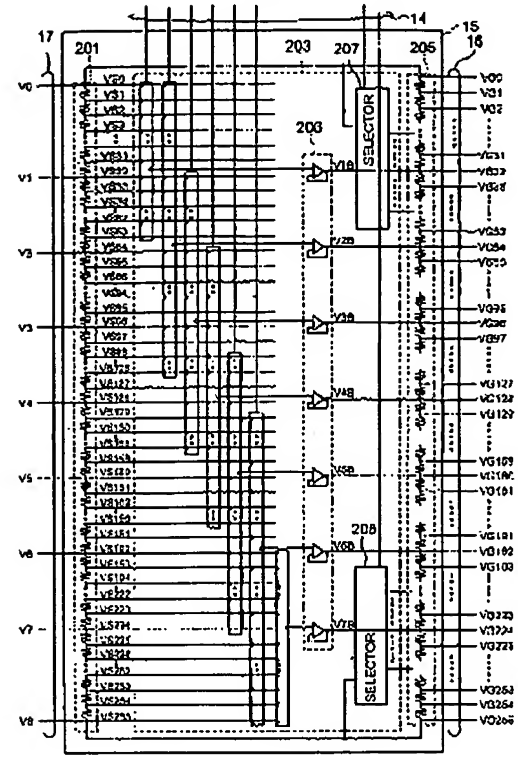


FIG. 6



As illustrated in FIG. 6 of Nitta, right, the gray scale voltage generating circuit 15 divides each of the respective reference voltages between eighteen plus and minus reference voltages (V0 – V8) and (V9 – V17) generated from a "power circuit 8" that are defined by the "selectors" 207 and 208 using resistors 205 to generate the plurality of gray scale voltages VG0 – VG255. Thus, although the Examiner contends that the gray scale voltage generating circuit 15, including the selectors 207 and 208, functions as a D/A converter, the gray scale voltage generating circuit 15 in fact functions as a voltage divider. It should be further noted that, at this point in Nitta, the divided voltages are all analog voltages, *i.e.*, analog signals going in and analog signals coming out.

Additionally, as illustrated in FIG. 1 of Nitta above and described at col. 4, lines 50-54 thereof, by operating the gray scale voltage selector 26, one of the analog gray scale voltages generated by the gray scale voltage generating circuit 15 is selected as a voltage corresponding to the display data, "DATA," which is stored in a "data latch B" 24 as a digital signal, and the voltage selected is then applied to the liquid crystal panel 10 through an output buffer 28. Accordingly, the purported "D/A converter" of Nitta is actually the gray scale voltage selector 26, not the gray scale voltage generating circuit 15.

Further, it may be noted that the register 13 does not store the digital liquid crystal display data, "DATA," but instead, "the correspondence relationships between the liquid crystal display data, DATA, and the liquid crystal gray scale voltages." (*Id.*, col. 4, lines 36-38, emphasis added.)

In light of the foregoing, it may seen that, although the Examiner contends that the gray scale voltage generating circuit 15 is a "D/A converter," the gray scale voltage generating circuit 15 of Nitta is actually a voltage divider that includes "selectors 207 and 208" to respectively generate and select the plurality of analog voltages that are used to drive the panel. That is, the gray

scale voltage generating circuit 15 of Nitta is not the same as, nor is it the functional equivalent of, the "digital/analog converter" of the present invention.

In addition, from the limitation of claim 1 above of the present invention, "a signal controller supplying image data to a data driver and generating a digital gray data based on a distribution of grays of the image data for one frame," it may be seen that the signal generated by the signal controller of the present invention is inherently a digital type of signal, whereas, the signal generated by the gray scale voltage generating circuit 15 of Nitta is inherently an analog type of signal. Thus, the present invention necessarily must utilize a true D/A converter to convert the modified digital gray data into an analog gray data for transmission to the data driver, whereas, Nitta does not need a D/A converter, since the gray scale voltage generating circuit 15 itself generates the analog signals and transmits them directly to the gray scale voltage selector 26, without any digital-to-analog signal conversion taking place. Thus, as stated at col. 4, lines 50-54 of Nitta, the gray scale voltage selector 26 of Nitta in fact corresponds to the data driver 500 of the present invention.

In reply to the Applicant-Appellant's assertions above that Nitta does not teach or suggest a D/A converter, the Examiner stated,

> "[T]he Applicants again argue that Nitta does not disclose a D/A converter in elements 11-15 of figure 1. ... The Examiner respectfully disagrees. Nitta's gray scale voltage generator does in part function as a voltage divider. There, however, is more functionality imparted in elements 11-15 than mere simple voltage division. Digital data signals are supplied to the elements (DATA and CL1 in fig. 1), and based on these inputs, a specific set of analog gray scale voltages are selected to be output. This would seem to the Examiner to satisfy the current requirements of a digital/analog converter. In short, digital data is accepted in, and in return, analog voltages specific to the digital data is output. As such, the rejections are seen as sufficient and are maintained." (Advisory Action dated 07/23/2007, section 11, emphasis added.)

Thus, the Examiner argues, simply put, that in Nitta, "digital data [goes] in and ... analog voltages specific to the digital data is output," and accordingly, that there necessarily must be a D/A converter somewhere in Nitta. However, this reasoning is flawed, since as discussed above and shown in FIGS. 1 and 6 of Nitta, the output signals 14 from the register 13, which are based

on "correspondence relationships" between the liquid crystal display data, DATA, and the liquid crystal gray scale voltages, function as control signals to control the operation of the selection circuit 203, while the input signals of the gray scale voltage generator 15 that outputs analog voltages VG0 – VG255 are input as analog reference voltages V0-V8 and V9-V17. Thus, Nitta does not teach or even suggest a "D/A converter," but rather, an "analog voltage selector."

In section 7 of the Final Office action, claims 4 and 13 were rejected under 35 U.S.C. 103(a) as being unpatentable over Nitta et al. above in view of Kitahara et al. (US 6,847,377). However, a review of the Kitahara '377 reference reveals that it does not supply any of the deficiencies in teaching of Nitta et al. '178 discussed above vis-à-vis independent claims 1 and 9, from which claims 4 and 13 depend, and accordingly, it is respectfully submitted that these claims are likewise patentably distinguishable over the combination of Nitta et al '178 and Kitahara et al '377.

In light of the foregoing patentably distinct differences between Nitta and the present invention, it is respectfully submitted that independent claims 1 and 9, as well as the claims respectively dependent from them, are patentably distinguishable over the Nitta et al. '178 and Kitahara '377 references, and accordingly, that the above rejections of claims 1 and 3-13 are erroneous and should be overruled by the Board.

WHEREFORE, in light of the above and other good and sufficient reasons, the Applicant-Appellant respectfully requests that the Honorable Board reverse the decision of the Examiner with respect to the rejection of claims 1 and 3 – 13 and hold these claims allowable over the art of record.

Respectfully submitted,

Date: January 28, 2008

By: Don C. Lawrence

Don C. Lawrence
Reg. No. 31,975

APPENDIX I – CLAIMS

1. (rejected) An apparatus for driving a liquid crystal display, including a plurality of pixels arranged in a matrix, the apparatus comprising:

a signal controller supplying image data to a data driver and generating digital gray data based on a distribution of grays of the image data for one frame; and,

a digital/analog converter converting the digital gray data from the signal controller into analog voltages and supplying the analog voltages to the data driver as the gray voltages,

the data driver selecting data voltages corresponding to the image data representing at least one gray from the gray voltages and applying the data voltages to the pixels.

2. (cancelled)

3. (rejected) The apparatus of claim 1, wherein each image data has a luminance data having a value, which is determined by the at least a gray represented by the image data and belonging to one of a plurality of value sections, and the gray distribution is associated with the number of the image data belong to respective value sections.

4. (rejected) The apparatus of claim 3, wherein each image data includes a set of image data portions for a predetermined number of respective colors, and the luminance data of the image data is defined as an average of the grays represented by the set of the image data portions forming the image data.

5. (rejected) The apparatus of claim 3, wherein the signal controller comprises a gray voltage generator reading out the image data for one frame, calculating the gray distribution of the image data and modifying a standard gray voltage curve to obtain the digital gray data.

6. (rejected) The apparatus of claim 5, wherein the gray voltage generator calculates the luminance data of the image data for one frame, calculates the number of the image data included in the value sections to obtain the gray distribution of the image data.

7. (allowable) The apparatus of claim 6, wherein the gray voltage generator calculates a target gray voltage (VGX') of each value section corresponding to the digital data voltage based on relations given by:

$\Delta VX' = \Delta VX \cdot (1+KX \cdot \Delta PX)$ and,

$VGX' = \Delta VX' \cdot (\Sigma\Delta V/\Sigma\Delta V') + VGX\text{-}1$,

where ΔVX is a difference between a maximum gray voltage and a minimum gray voltage for the value section on the standard gray voltage curve, KX is a weight value assigned to the section, ΔPX is defined as PX- (AP)X, where PX is a distribution probability for the value section and (AP)X is a distribution probability for maintaining the standard gray voltage curve, ΣΔV is a sum of the differences (ΔVX) between maximum gray voltages and minimum gray voltages for the respective value sections on the standard gray voltage curve, ΣΔV' is a sum of ΔVX', and VGX-1 is a maximum gray voltage of a previous value section in the standard gray voltage curve.

8. (allowable) The apparatus of claim 7, wherein the weight value (KX) for each section is determined as the value exhibiting the best visibility for the value section.

9. (rejected) A method for driving a liquid crystal display, the method comprising:

reading out image data representing at least a gray for one frame;

calculating gray distribution of the read image data;

modifying a standard gray voltage curve based on the calculated gray distribution to generate digital gray data;

converting the digital gray data into analog voltages; and

supplying the analog voltages to a data driver as gray voltages.

10. (rejected) The method of claim 9, wherein the gray distribution calculation comprises:

calculating luminance data of the image data based on the at least a gray represented by the image data; and,

counting the number of the image data included in a plurality of sections of the luminance data.

11. (allowable) The method of claim 10, wherein the digital data voltage (VGX') is calculated based on relations given by:

$\Delta VX' = \Delta VX \cdot (1+KX \cdot \Delta PX)$ and,

$VGX' = \Delta VX' \cdot (\Sigma\Delta V/\Sigma\Delta V') + VGX\text{-}1$,

where ΔVX is a difference between a maximum gray voltage and a minimum gray voltage for the value section on the standard gray voltage curve, KX is a weight value assigned to the section, ΔPX is defined as PX- (AP)X, where PX is a distribution probability for the value section and (AP)X is a distibution probability for maintaining the standard gray voltage curve, $\Sigma\Delta V$ is a sum of the differences (ΔVX) between maximum gray voltages and minimum gray voltages for the respective value sections on the standard gray voltage curve, $\Sigma\Delta V'$ is a sum of $\Delta VX'$, and VGX-1 is a maximum gray voltage of a previous value section in the standard gray voltage curve.

12. (allowable) The method of claim 11, wherein the weight value (KX) for each section is determined as the value exhibiting the best visibility for the value section.

13. (rejected) The method of claim 10, wherein each image data includes a set of image data portions for a predetermined number of respective colors, and the luminance data of the image data is defined as an average of the grays represented by the set of the image data portions forming the image data.

APPENDIX III - EVIDENCE

No evidence was submitted pursuant to §§ 1.130, 1.131, or 1.132.

APPENDIX IV - RELATED PROCEEDINGS

There are no related proceedings or decisions rendered by a court of the Board.